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## User Study Contributes to Rio Grande Management

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**Raft in Boquillas Canyon, Big Bend NP.** This river section is also part of the Rio Grande Wild and Scenic River. El Pico, of the Sierra Del Carmens, is the prominent peak in the background.

A recently completed user study of the Rio Grande in Big Bend NP, undertaken in pursuit of a river use management plan, comprised four areas of investigation associated with river users:

- (1) a trend study of 16,500 river permits that documented river use from 1983 through 1992;
- (2) a survey of boaters who obtained private river use permits;
- (3) a survey of visitors who obtained overnight backcountry permits to camp at designated sites adjacent to the river, and

- (4) a survey of patrons of commercial outfitters associated with float trips on the Rio Grande.

The forthcoming River Use Management Plan (RUMP) will be the first of its kind for the Rio Grande River in Big Bend NP. Big Bend's regulations pertaining to river operations heretofore have been contained in other

types of management plans. The RUMP is being developed as a response to specific questions regarding river management objectives and use procedures.

It also is being designed to provide standard operational information to patrol rangers, resource management, and visitor contact staff. In addition to the user study, an ongoing study regarding recreation and trespass-livestock impacts to the riparian ecosystem will provide research-based information to the developing RUMP.

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# Trail Conditions and Management Problems

By Jeffrey L. Marion

The author and colleagues Joe Roggenbuck and Bob Manning recently conducted a survey of NPS managers to describe visitor-related backcountry recreation management problems and practices. The survey and resulting NPS Natural Resources Report (available from Donna O'Leary—see references) address the following topics: (1) managers' perceptions of the types and severity of backcountry recreation management problems, (2) actions implemented to resolve problems, (3) managers' perceptions of the success of implemented actions, (4) managers' knowledge and application of carrying capacity models, and (5) the type and extent of monitoring efforts employed to assess impacts caused by recreational use.

Also available on request, is a computer diskette with dBASE III Plus databases containing information characterizing each park unit and the specific actions implemented to address backcountry recreation management problems. These databases are intended to facilitate communication of alternative backcountry recreation management practices. Instructions permit users to identify and list parks comparable to their own that employ specific backcountry recreation management actions. Contacts and phone numbers are included to facilitate dialog regarding implementation methods, administrative costs, supporting actions, effectiveness, and other factors which could not be characterized by the study.

This article presents selected results from the survey regarding manager's evaluations of trail resource conditions and the trail management actions they employ.

Management objectives for backcountry or natural zones call for the preservation of park resources and ecological processes in as natural a condition as possible. Visitor activities in these remote park areas tend to concentrate along trails, in scenic attraction areas, and on campsites. In particular, trails and trail networks play a significant role in shaping visitor access and distribution patterns in parks. Trails must support substantial traffic from both day and overnight visitors.

Trail impacts include a wide variety of problems, including loss of vegetation cover, incision and soil loss of the tread surface, widening of the tread, compaction of soil, proliferation of informal trails, and the results of various deprecative behaviors such as littering and cutting of trail switchbacks. Without proper trail maintenance programs these problems can alter natural patterns of water runoff, resulting in soil erosion and

subsequent turbidity and deposition in streams and other water bodies. Trails concentrate visitation and provide an avenue for transportation. While some impact is unavoidable, excessive trail impacts threaten both the safety of trail users and the quality of their recreational experiences.

## Study Methods

A mail-back questionnaire was sent to all NPS units judged to have substantial backcountry resources and overnight visitation. The park list was compiled from those parks specifically offering backcountry camping as described in *The National Parks: Camping Guide 1988-89*, and parks with significant backcountry overnight visitation reported to the NPS Socio-Economic Studies Office for the years 1986-90. Surveys were sent to park superintendents in September 1991 with a request that they be directed to park staff with responsibility for backcountry recreation management. The need for input from resource management staff was also noted. Compliance was high, with a return of 93 completed surveys for a 92 percent response rate. Additionally, 7 of the 8 non-responding parks were among the lowest in backcountry visitation. Completed surveys were input into dBASE III Plus databases and transferred to the SPSS-PC+ statistical package for analysis.

## Results

NPS backcountry areas have a mean of 125 miles of official trail and 59 miles of unofficial trail (Table 1). However, these means reflect substantial trail systems in a

Table 1. Miles of official and unofficial backcountry trails.

Miles	Official Trails Number of Parks	Unofficial Trails Number of Parks
0	15	17
1 - 25	22	23
26 - 50	13	5
51 - 100	16	3
101 - 250	10	3
251 - 500	3	1
Over 500	9	2
Official Trails: Mean = 125, Median = 35		
Unofficial Trails: Mean = 59, Median = 5		

few areas; for example, 9 parks had over 500 miles of official backcountry trails. The typical area (as reflected in median values) has 59 miles of official trails and 5 miles of unofficial trails. Interestingly, 17 percent of the backcountry areas in our survey had no officially recognized backcountry trails.

Backcountry managers rated the perceived severity of 5 types of trail impacts using a problem severity scale based on the geographical extent of problems. Data from the two highest categories, "a problem in many areas" and "a problem in most areas" were combined, as presented in Table 2. Nearly one-half of all park managers reported that soil erosion on trails was a problem in many or most areas of the backcountry. Problems

Table 2. Managers' evaluation of the extent of backcountry trails impacts.

	Parks Where Impact is a Problem in Many or Most Areas	
	Number	Percent
Soil erosion	37	44
Trail widening	26	31
Braided or multiple treads	24	29
Creation of undesired trails	24	29
Excessive trail muddiness	21	25

with trail widening was cited by 31 percent of parks, and 29 percent rated the formation of braided or multiple trails and the creation of undesired trails as serious problems.

The recreational activities that occur in backcountry areas vary in their environmental impacts to trail resources. backcountry managers were asked to indicate the extent to which they perceived day use, overnight use, recreation stock, off-road vehicles/all-terrain vehicles (ORVs/ATVs), and mountain bikes contributed to trail impacts. Three kinds of recreational use were predominant as causal agents for trail impacts: day use, horse use, and overnight use (Table 3). The percentages of parks citing these three uses as moderate or major causes were 47 percent, 43 percent, and 34 percent, respectively. Managers reported that day use is more common than overnight use in 70 percent of the backcountry areas and accounts for about 2/3 of all use. Also, while only 3 backcountry areas have more than 25 percent of their use made up by

Table 3. Managers' ratings of extent to which various recreation activities are a moderate or major cause of trail impacts.

Recreational Activities	Trail Impacts	
	Number	Percent
Day Use	39	47
Overnight Use	28	34
Horse Use	30	43
ORV/ATV Use	8	14
Mountain Bike Use	6	10

# actices in the National Park Service

**Table 4. Actions taken by park managers to reduce trail impacts**

Action	parks taking the action.	
	Number	Percent
Discourage off-trail travel	44	47
Encourage off-trail travel	10	11
Teach minimum-impact hiking techniques	32	34
Discourage use of unofficial trails	42	45
Discourage trail use during seasons when soils are saturated	19	20
Relocate trails from fragile to durable soils or vegetation types	38	41
Relocate trails to avoid steep grades	40	43
Perform regular general trail maintenance	48	52
Delineate trail edges to keep visitors on a defined tread	23	25
Close or rehabilitate impacted trails	27	29
Close or rehabilitate undesired trails	41	44
Install trail bog bridges or corduroy	28	30
Seed or transplant vegetation on trails	15	16
Apply trail soil cement	1	1
Gravel trails	13	14
Other: install hardening/boardwalks over sensitive areas	2	2

horse users, 43 percent of the parks see horse use as a moderate or major cause of trail impacts.

Managers have implemented a variety of actions to address backcountry trail management problems. A comprehensive list of potential actions was provided to managers, who were asked to indicate which actions were currently employed in all or some portion of their park's backcountry. Managers also had the option of listing additional actions. Trail maintenance, visitor communication/education, and trail closure were among the predominant actions used to address trail problems (Table 4). Surprisingly, managers reported that only 1/2 of all backcountry areas receive regular general trail maintenance.

Communication is used at nearly 1/2 of the parks to discourage visitors from travelling off-trail or using unofficial trails. These actions concentrate visitor use and trampling impacts on formally designated and maintained trails. In contrast, managers at 10 parks sought to minimize trail impacts through visitor dispersal by encouraging off-trail travel. Education to promote minimum impact hiking techniques was employed by managers at 1/3 of the parks and 1/5 reported that they discourage trail use during seasons when soils are saturated.

Trail relocation is used by 41 percent of the backcountry managers to shift trails from fragile to more durable soils or vegetation types. Undesired or user-created trails are actively closed and rehabilitated at 44 percent of the parks, a practice used by 29 percent of the parks for highly impacted trails.

As previously noted, horse users were perceived by managers to cause trail impacts out of proportion to their numbers. Managers reported that of the 60 areas that were open to horses, 55, (or 92%) prohibit horses within certain areas or on certain trails in the backcountry. Furthermore, 39 percent prohibited, and an additional 10 percent discouraged horse use from off-trail travel. Managers limit horse numbers at 1/2 of the areas open to horses; number of horses/group ranged from 0 to 50 with a mean of 12 and a median of 10.

Another survey section asked managers to list and rate the perceived effectiveness of specific actions implemented in response to common problems that had been effectively addressed. Most of the highly rated actions implemented to address trail impacts involved some form of trail work. Such actions included trail maintenance and rehabilitation, boardwalk installation, and delineation of trail treads. Some moderately effective actions included temporarily closing and relocating badly eroded trails, designation of trails for different uses, and promoting dispersed hiking. Backcountry managers generally rated visitor communication and education actions, such as signing of informal trails and promotion of low impact trail use, as somewhat effective.

Finally, managers were asked to list and describe monitoring efforts used to assess the effects of visitor use on the condition of trail resources. Trail impact monitoring was conducted at only 8 parks. Monitoring approaches included rapid assessment rating and measurement methods for documenting trail width and incision and research methods employing measurements of vegetation and

soil loss. Trail inventory surveys designed primarily for assessing trail maintenance needs were conducted at 12 parks. These are typically conducted by maintenance division staff for the purpose of setting trail maintenance priorities and directing work. Informal evaluations of trail impacts and trail maintenance needs, typically conducted by field rangers during routine patrols, were used by 18 parks.

## Summary and Implications

Of 8 types of backcountry recreation impacts evaluated, park managers perceived trail impacts to be the most severely pervasive problem. A surprising finding was that day users were perceived to be the most common type of backcountry visitor and that 47 percent of park managers cited day use as a predominant cause of trail impacts. Currently few parks attempt to measure day use and only 8 percent of the parks require permits for day users. Horse users, a relatively small percentage of the total use in most backcountry areas, also were perceived to be a predominant cause of trail impacts. Additional management and research attention is needed for these types of uses.

The most common and, according to managers, the most effective action employed to address trail impacts was trail maintenance. However, managers at only 1/2 of the parks indicated that routine trail maintenance was conducted in all or some portion of their backcountry. Additional resources and attention to professional and volunteer trail maintenance efforts are needed to address the serious and widespread nature of trail resource problems. Finally, a primary limitation of this survey was its reliance on manager's perceptions of resource problems and the effectiveness of implemented actions. Little objective data exists for any of the backcountry recreation management problems identified in the survey. For example, trail impact monitoring is conducted in only 9 percent of the parks. Additional monitoring is necessary to provide more objective information about changing resource conditions and the effectiveness of alternative management actions.

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## References Cited

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